



NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

June 13, 2016

HELICOPTER SPECIALIST'S FACTUAL REPORT

NTSB No: CEN15LA156

A. ACCIDENT

Operator: Era Helicopters LLC
Aircraft: AgustaWestland AW119 MK II, Registration N802SM
Location: Houma, Louisiana
Date: February 20, 2015
Time: 0750 central standard time

B. GROUP

No group was formed.

LIST OF ACRONYMS

ATT	aircraft total time
EAD	emergency airworthiness directive
EASA	European Aviation Safety Agency
FAA	Federal Aviation Administration
mm	millimeter
MM	maintenance manual
Nm	Newton-meter
NTSB	National Transportation Safety Board
OEM	original equipment manufacturer
OM	overhaul manual
P/N	part number
PCL	pitch change link
PHP	Precision Heliparts
S/N	serial number

C. SUMMARY

On February 20, 2015, about 0750 central standard time, an AgustaWestland AW119 MK II helicopter, N802SM, experienced a flight control anomaly during cruise flight over the Gulf of Mexico. The helicopter was registered to, and operated by, Era Helicopters LLC under the provisions of 14 *Code of Federal Regulations* Part 135 as an on-demand air taxi flight. Visual meteorological conditions prevailed for the flight which operated on a company visual flight rules flight plan. The flight departed Houma-Terrebonne Airport, Houma, Louisiana. During cruise flight, the pilot reported an abrupt, uncommanded left yaw and an associated lack of right pedal authority. The pilot returned to Houma-Terrebonne Airport and performed a run-on landing. The pilot and three passengers were not injured. A post-flight inspection of the helicopter revealed one of the tail rotor pitch change links (PCL) was fractured. No additional damage to the helicopter was discovered. The two tail rotor PCLs were retained for further examination.

On June 30, 2015, representatives from the National Transportation Safety Board (NTSB), AgustaWestland, Precision Heliarts (PHP), Era Helicopters, and the Federal Aviation Administration (FAA) convened at AgustaWestland facilities in Philadelphia, Pennsylvania to evaluate the bearing rotational torque for the tail rotor PCLs. The bearing rotational torque of the fractured PCL was found to exceed allowable limits. Additionally, two different methods for measuring rotational torque were identified in the overhaul manual (OM) that led to differing rotational torque measurements.

C. DETAILS OF THE INVESTIGATION

1.0 HELICOPTER INFORMATION

The AgustaWestland AW119 MK II helicopter has a four-bladed, fully articulated main rotor system that provides helicopter lift and thrust, and a two-bladed teetering tail rotor system that provides main rotor anti-torque and directional control. The helicopter is equipped with one Pratt & Whitney Canada PT6B-37A turboshaft engine. The helicopter is type certificated under FAA type certificate data sheet No. H7EU.

1.1 TAIL ROTOR PCL INFORMATION

The tail rotor PCL assembly, P/N 109-130-05-117, comprises a single-piece cast aluminum body with two circular ends, each end containing a spherical bearing. The PCL end connected to the tail rotor blade contains the larger of the two spherical bearings, and is identified as the “large bearing” in this report. The PCL end connected to the tail rotor pitch change hub is identified as the “small bearing” in this report. The large bearing is part number (P/N) 109-0133-11-101 and the small bearing is P/N 11HWG04.

2.0 TECHNICAL INVESTIGATION FINDINGS

2.1 PCL S/N MO.3000 HISTORY

Both the fractured and opposing tail rotor PCLs removed from N802SM were identified as P/N 109-130-05-117. The fractured PCL was identified as serial number (S/N) MO.3000; the opposing tail rotor PCL was identified as S/N MO.2781. **Photo 1** was provided by Era Helicopters documenting the condition of the tail rotor PCLs as found during the post-landing

inspection performed after the run-on landing at HUM. **Photo 2** was provided by Era Helicopters documenting PCL S/N MO.3000 after its removal from N802SM.



Photo 1. The fractured and opposing tail rotor PCLs during post-landing inspection. (Photo courtesy of Era Helicopters)



Photo 2. PCL S/N MO.3000 after removal from N802SM. (Photo courtesy of Era Helicopters)

According to PHP Work Order No. L0220C, dated August 26, 2014, PCL MO.3000 was received for overhaul due to “bearings worn beyond limits.” The PCL was overhauled and an authorized release certificate (FAA Form 8130-3) was issued on December 8, 2014.

According to the Era Helicopters Aircraft Logsheet No. 127927 for N802SM, on February 13, 2015, an entry was made in the “discrepancies” column that the installed tail rotor PCLs exceeded its bearing play check. Both the tail rotor PCLs were removed and replaced with newly overhauled PCL S/Ns MO.3000 and MO.2781. Logsheet No. 127927 stated the aircraft total time (ATT) was about 4,485.7 flight hours. The ATT at the time of the accident was

reported to be about 4,500.5 flight hours. Thus, PCL S/Ns MO.3000 and MO.2781 accumulated about 14.8 flight hours since their last overhaul. According to Era Helicopters, PCL S/N MO.3000 had accumulated a component total time of 1,129.8 flight hours.

2.2 PCL EXAMINATION AT AGUSTAWESTLAND

On June 30, 2015, representatives from the National Transportation Safety Board (NTSB), AgustaWestland, PHP, Era Helicopters, and the FAA convened at AgustaWestland facilities in Philadelphia, Pennsylvania to evaluate the bearing friction for the tail rotor PCLs.

According to the AgustaWestland AW119 MK II OM, Section 64-31-01, titled “Pitch Change Mechanism”, after the tail rotor PCL bearing(s) have been staked, a bearing rotational torque inspection required the rotational torque to be between 0.1 – 0.7 Newton-meters (Nm).¹ The last step in the bearing replacement procedure was to mark the staked area with a blue, yellow, and green dot to indicate satisfactory results of three bearing staking inspection criteria, one of which was the bearing rotational torque.

The tail rotor PCL bearing rotational torque requirement was found to be the same within Revision 6 of the AgustaWestland AW119 MK II maintenance manual (MM), Section 64-31. However, the method of inspecting PCL bearing rotational torque was found to be different between an earlier version of the AW119 MK II OM, dated November 25, 2012, and a more recent version of the OM, dated November 10, 2014. The 2012 version of the OM required rotational torque inspection by rotating the inspection tool, a 100 millimeter (mm) lever arm, about the axis of the bearing bolthole, while the 2014 version of the OM required the inspection tool to be rotated away from the axis of the bearing bolthole (**Figure 1**). The bearing replacement procedures between the 2012 and 2014 versions of the OM remained the same. AgustaWestland identified the 2012 version of the OM contained the correct bearing rotational torque inspection method. PHP identified they had used the 2014 version of the bearing rotational torque inspection method.

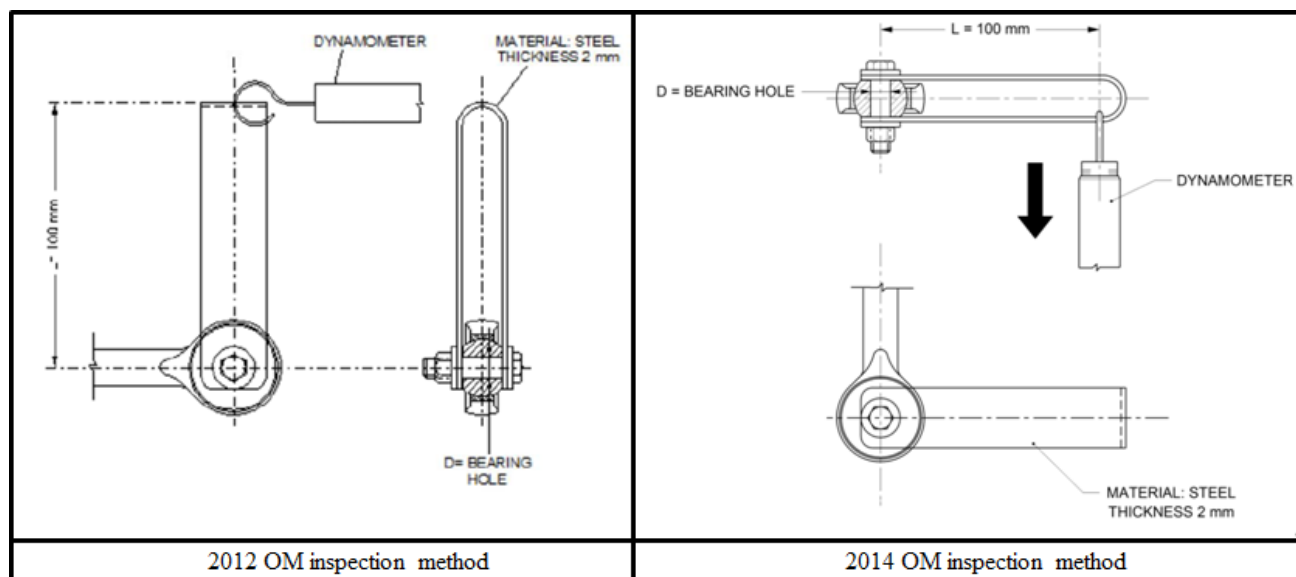


Figure 1. The bearing rotational torque inspection methods. (Image courtesy of AgustaWestland)

¹ 1 Nm is about 8.85 inch-pounds. For this report, all measurements will be in metric units because the AgustaWestland manuals are published using metric units.

The bearing rotational torque of PCL S/N MO.3000 and S/N MO.2781 were inspected using both 2012 and 2014 inspection methods, with the results shown in [Table 1](#). Both the large and small bearings of PCL S/N MO.3000 exceeded the maximum allowable bearing rotational torque. Both the large and small bearings of PCL S/N MO.2781 were within the allowable range for bearing rotational torque. Overall, the 2012 inspection method consistently returned a higher rotational torque value than the 2014 inspection method when the rotational torque reading was greater than 0.01 Nm. The blue, yellow, and green inspection dots were not observed on the bearings for both PCLs. PHP stated there was no material callout for the inspection dots within the bearing replacement procedures, thus the inspection dots were not applied to PCLs after the bearings were replaced. AgustaWestland stated the material used for the inspection dots was a torque stripe compound.

Table 1. Bearing rotational torque inspection results.

	S/N MO.3000	S/N MO.2781
Large Bearing, 2012 Method	4.17 Nm	0.34 Nm
Large Bearing, 2014 Method	2.45 Nm	<0.01 Nm
Small Bearing, 2012 Method	2.45 Nm	<0.01 Nm
Small Bearing, 2014 Method	1.67 Nm	<0.01 Nm

2.3 PCL BEARING REPLACEMENT TOOLS

The PCL bearing replacement procedures references original equipment manufacturer (OEM) toolset “LSE No. 64” for the replacement of bearing P/N 109-0133-11-101 and toolset “LSE No. 65” for the replacement of bearing P/N 11HWG04. According to PHP, the toolset used in replacing the bearings for PCL S/N MO.3000 was manufactured by CABCO Industries, Inc. The toolset manufacturer classified toolset P/N AT-6-411 as a functional equivalent to toolset LSE No. 64 and toolset P/N AT-103-4 as a functional equivalent to toolset LSE No. 65.

2.4 PCL METALLURGICAL FINDINGS

PCL S/N MO.3000 and MO.2781 were examined by the NTSB Materials Laboratory in Washington, District of Columbia. The fracture surface of PCL S/N MO.3000 exhibited evidence of fatigue originated at a raised dash that was part of the PCL P/N marking on the PCL. The materials laboratory characterized fatigue cracking across 60% to 70% of the fracture cross section. For additional details on the materials laboratory examination, see Materials Lab Factual Report No. 15-084 in the docket for this investigation.

3.0 CORRECTIVE ACTIONS

On March 4, 2015, the FAA issued emergency airworthiness directive (EAD) No. 2015-05-52 for owners and operators of certain A109-series and AW119-series helicopters to inspect PCL P/N 109-0130-05-117 for freedom of movement, corrosion, excessive friction of the spherical bearings, and cracks. FAA EAD No. 2015-05-52 was prompted by European Aviation Safety Agency (EASA) issuance of EASA EAD No. 2015-0035-E on February 27, 2015. According to AgustaWestland and the FAA, there have been no reports to date of tail rotor PCL spherical bearings exhibiting excessive friction after inspection directed via the aforementioned FAA and EASA EADs.

Prior to FAA EAD No. 2015-05-52, the FAA issued AD No. 2013-05-22, effective April 30, 2013, for owners and operators of certain A109-series and A119 helicopters to inspect tail rotor PCL P/N 109-0130-05-117, with less than 100 hours time-in-service and with a S/N with a prefix of “MO” and S/N 001 through 773 and without the letter “T” suffix after the S/N. The AD required inspection of the tail rotor PCL spherical bearings for excessive rotational friction and the PCL body for evidence of cracks.

Based on the findings of this investigation, AgustaWestland had corrected the figure within the tail rotor PCL bearing replacement procedures to display the correct method of inspecting spherical bearing rotational torque. Additionally, the PCL bearing replacement procedures were removed from the MM and are now found only within the OM.

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